

**LATEX TEMPLATE: M. TECH.**  
**THESIS TITLE HERE**

**THESIS**

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR  
THE AWARD OF THE DEGREE OF

**MASTER OF TECHNOLOGY**  
*(Electronics & Communication Engineering)*

SUBMITTED BY

**Satvir Singh**

[ Univ. Roll No. 316049601]

July 2009



**PUNJAB TECHNICAL UNIVERSITY**  
**KAPURTHALA, INDIA**

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SBS College of Engineering & Technology

Moga Roar, Ferozepur-152004

July 2009

**PUNJAB TECHNICAL UNIVERSITY  
KAPURTHALA, INDIA**

## *Declaration*

I hereby certify that the work which is being presented in the thesis entitled "TITLE HERE" by "SATVIR SINGH SIDHU" in partial fulfillment of requirements for the award of degree of M.Tech. (Electronics & Communication Engineering) submitted in the Department of (Electronics & Communication Engineering) at SBS College of Engineering & Technology, Moga Road, Ferozepur-152004 under PUNJAB TECHNICAL UNIVERSITY, JALANDHAR is an authentic record of my own work carried out during a period from 2008 to 2010 under the supervision of DR ARUN KHOSLA & DR J. S. SAINI. The matter presented in this thesis has not been submitted by me in any other University / Institute for the award of M.Tech Degree.

Signature: \_\_\_\_\_ (SATVIR SINGH)

This is to certify that the above statement made by the candidate is correct to the best of my/our knowledge.

Signature of the SUPERVISOR(S) \_\_\_\_\_

The M.Tech Viva-Voce Examination of SATVIR SINGH SIDHU has been held on .....and accepted.

Signature of the EXTERNAL EXAMINER \_\_\_\_\_

Signature of the HEAD, DEPARTMENT OF ECE \_\_\_\_\_

# *Abstract*

The Thesis Abstract is written here (and usually kept to just this page). The page is kept centered vertically so can expand into the blank space above the title too...

Place: Ferozepur

Satvir Singh

Date: July 10, 2009

# *Acknowledgements*

The acknowledgements and the people to thank go here, don't forget to include your project advisor...

Place: Ferozepur

Satvir Singh

Date: July 10, 2009

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# Abbreviations

**LAH**      List Abbreviations **H**ere  
**T2 FLS**    Type-**2** Fuzzy Logic **S**ystem

# Notations

$\mu(x)$	Membership Function
$\overline{\mu(x)}$	Upper Membership Function
$\underline{\mu(x)}$	Lower Membership Function

# Chapter 1

## Brief Help

### 1.1 Welcome and Thank You

Welcome to this “ $\text{\LaTeX}$  Thesis Template”, a beautiful and easy to use template for writing a thesis using the  $\text{\LaTeX}$  typesetting system.

If you are writing a thesis (or will be in the future) and its subject is technical or mathematical (though it doesn’t have to be), then creating it in  $\text{\LaTeX}$  is highly recommended as a way to make sure you can just get down to the essential writing without having to worry over formatting or wasting time arguing with your word processor.

$\text{\LaTeX}$  is easily able to professionally typeset documents that run to hundreds or thousands of pages long. With simple mark-up commands, it automatically sets out the table of contents, margins, page headers and footers and keeps the formatting consistent and beautiful. One of its main strengths is the way it can easily typeset mathematics, even *heavy* mathematics. Even if those equations are the most horribly twisted and most difficult mathematical problems that can only be solved on a super-computer, you can at least count on  $\text{\LaTeX}$  to make them look stunning.

### 1.2 $\text{\LaTeX}$ eBooks

Five most important eBooks downloaded from various websites are given in the “ $\text{\LaTeX}$  eBooks” folder. One can go through and/or refer to them as and when required.

## 1.3 Folders

**Appendices** – this is the folder where you put the appendices. Each appendix should go into its own separate ‘.tex’ file.

**BackMatter** – this is folder that contain all the material that is required at the end of thesis, e.g., Reference.bib, Resume.tex and authors photo, etc.

**Chapters** – this is the folder where you put the thesis chapters. A thesis usually has about seven chapters, though there is no hard rule on this. Each chapter should go in its own separate ‘.tex’ file and they usually are split as:

- Chapter1: Introduction to the thesis topic
- Chapter2: Background information and theory
- Chapter3: (Laboratory) experimental setup
- Chapter4: Details of experiment 1
- Chapter5: Details of experiment 2
- Chapter6: Discussion of the experimental results
- Chapter7: Conclusion and future directions

**ChapterX/Figures** – this folder contains the all figures related to this chapters of the thesis. These are the final images that will go into the thesis document.

**FrontMatter** – this is folder that contain all the material that is required before the Chapters of thesis start, e.g., Abreviattion.tex, Abstract.tex, Acknowledgement.tex, Declaration.tex, Logo.pdf, Notation.tex, and backup of all tex files etc.

**Latex eBooks** – Five useful eBooks on L<sup>A</sup>T<sub>E</sub>X are given in this folder as help to the users/authors.

**Missing Packages** – Some useful packages are provided herewith those may be missing in installed software.

**Primitives** – this is the folder that contains scraps, particularly because one final image in the ‘Figures’ folder may be made from many separate images and photos, these source images go here. This keeps the intermediate files separate from the final thesis figures.

## 1.4 Other L<sup>A</sup>T<sub>E</sub>X Files in Main Folder

Included are also several files, most of them are plain text and you can see their contents in a text editor. Luckily, many of them are auxiliary files created by L<sup>A</sup>T<sub>E</sub>X or BibTeX and which you don't need to bother about:

**Bibliography.bib** – this is an important file that contains all the bibliographic information and references that you will be citing in the thesis for use with BibTeX. You can write it manually, but there are reference manager programs available that will create and manage it for you. Bibliographies in L<sup>A</sup>T<sub>E</sub>X are a large subject and you may need to read about BibTeX before starting with this.

**Thesis Todo List.txt** – this is a Todo list that provides a simple way to track the thesis progress and also helps you see what parts need attention. Inside is a structured layout for you to enter all this information. Do not try to fill it out all at once, but write the tasks in as you come across them i.e. write an entry for a figure that needs creating only when you refer to or write about it (and hence need to place it) in the thesis text.

**Thesis.cls** – this is an important file. It is the style file that tells L<sup>A</sup>T<sub>E</sub>X how to format the thesis. You will also need to open this file in a text editor and fill in your own information (such as name, department, institution). Luckily, this is not too difficult and is explained in section 1.5 on page 4.

**Thesis.pdf** – this is your beautifully typeset thesis (in the PDF file format) created by L<sup>A</sup>T<sub>E</sub>X.

**Thesis.tex** – this is an important file. This is the file that you tell L<sup>A</sup>T<sub>E</sub>X to compile to produce your thesis as a PDF file. It contains the framework and constructs that tell L<sup>A</sup>T<sub>E</sub>X how to layout the thesis. It is heavily commented so you can read exactly what each line of code does and why it is there. After you put your own information into the 'Thesis.cls' file, go to this file and begin filling it in – you have now started your thesis!

**vector.sty** – this is a L<sup>A</sup>T<sub>E</sub>X package, it tells L<sup>A</sup>T<sub>E</sub>X how to typeset mathematical vectors. Using this package is very easy and you can read the documentation on the site (you just need to look at the 'vector.pdf' file):

<http://www.ctan.org/tex-archive/macros/latex/contrib/vector/>

**lstpatch.sty** – this is a L<sup>A</sup>T<sub>E</sub>X package required by this LaTeX template and is included as not all T<sub>E</sub>X distributions have it installed by default. You do not need to modify this file.

Files that are *not* included, but are created by L<sup>A</sup>T<sub>E</sub>X as auxiliary files include:

**Thesis.aux** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file.

**Thesis.bbl** – this is an auxiliary file generated by BibTeX, if it is deleted, BibTeX simply regenerates it when you run the main tex file. Whereas the ‘.bib’ file contains all the references you have, this ‘.bbl’ file contains the references you have actually cited in the thesis and is used to build the bibliography section of the thesis.

**Thesis.blg** – this is an auxiliary file generated by BibTeX, if it is deleted BibTeX simply regenerates it when you run the main ‘.tex’ file.

**Thesis.lof** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file. It tells L<sup>A</sup>T<sub>E</sub>X how to build the ‘List of Figures’ section.

**Thesis.log** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file. It contains messages from L<sup>A</sup>T<sub>E</sub>X, if you receive errors and warnings from L<sup>A</sup>T<sub>E</sub>X, they will be in this ‘.log’ file.

**Thesis.lot** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file. It tells L<sup>A</sup>T<sub>E</sub>X how to build the ‘List of Tables’ section.

**Thesis.out** – this is an auxiliary file generated by L<sup>A</sup>T<sub>E</sub>X, if it is deleted L<sup>A</sup>T<sub>E</sub>X simply regenerates it when you run the main ‘.tex’ file.

So from this long list, only the files with the ‘.sty’, ‘.bib’, ‘.cls’ and ‘.tex’ extensions are the most important ones. The other auxiliary files can be ignored or deleted as L<sup>A</sup>T<sub>E</sub>X and BibTeX will regenerate them.

## 1.5 Filling in the ‘Thesis.cls’ File

You will need to personalise the thesis template and make it your own by filling in your own information. This is done by editing the ‘Thesis.cls’ file in a text editor.

Open the file and scroll down, past all the ‘\newcommand...’ items until you see the entries for ‘University Name’, ‘Department Name’, etc....

Fill out the information about your group and institution and ensure you keep to block capitals where it asks you to. You can also insert web links, if you do, make sure you use the full URL, including the ‘http://’ for this.

The last item you should need to fill in is the Faculty Name (in block capitals). When you have done this, save the file and recompile ‘`Thesis.tex`’. All the information you filled in should now be in the PDF, complete with web links. You can now begin your thesis proper!

- Line 153 & 154: Change the Name of College in both lines
- Line 156 & 157: Change the Name of College in both lines (All Capitals)
- Line 159 & 160: Change for the Department you belongs to
- Line 162 & 163: Change for the Department you belongs to (All Capitals)
- Line 164: Change to your University Roll No.

## 1.6 The ‘`Thesis.tex`’ File Explained

The `Thesis.tex` file contains the structure of the thesis. There are plenty of written comments that explain what pages, sections and formatting the  $\text{\LaTeX}$  code is creating. Initially there seems to be a lot of  $\text{\LaTeX}$  code, but this is all formatting, and it has all been taken care of so you don’t have to do it.

Begin by filling out your information for the title page. For the thesis declaration, your institution may insist on something different than the text given. If this is the case, just replace what you see with what is required.

Next comes the acknowledgements. On this page, write about all the people who you wish to thank (not forgetting parents, partners and your advisor/supervisor).

The contents pages, list of figures and tables are all taken care of for you and do not need manually creating or editing. The next set of pages are optional and can be deleted since they are for a more technical thesis: Insert a list of abbreviations you have used in the thesis, then a list of the physical constants and numbers you refer to and finally, a list of mathematical symbols used in any formulae. Making the effort to fill these tables means the reader has a one-stop place to refer to instead of searching the internet and references to try and find out what you meant by certain abbreviations or symbols.

The list of symbols is split into the Roman and Greek alphabets. Whereas the abbreviations and symbols ought to be listed in alphabetical order (and this is *not* done automatically for you) the list of physical constants should be grouped into similar themes.



Finally, there is the section where the chapters are included. Uncomment the lines (delete the ‘%’ character) as you write the chapters. Each chapter should be written in its own file and put into the ‘Chapters’ folder and named ‘**Chapter1**’, ‘**Chapter2**’, etc. . . Similarly for the appendices, uncomment the lines as you need them. Each appendix should go into its own file and placed in the ‘Appendices’ folder.

After the preamble, chapters and appendices finally comes the bibliography. The bibliography style (called ‘**unsrtnat**’) is used for the bibliography and is a fully featured style that will even include links to where the referenced paper can be found online. Do not under estimate how grateful you reader will be to find that a reference to a paper is just a click away.

## 1.7 Thesis Features and Conventions

To get the best out of this template, there are a few conventions that you may want to follow.

One of the most important (and most difficult) things to keep track of in such a long document as a thesis is consistency. Using certain conventions and ways of doing things (such as using the Todo list) makes the job easier. Of course, all of these are optional and you can adopt your own method.

### 1.7.1 Printing Format

This thesis template is designed for single sided printing as most theses are printed and bound this way. This means that the left margin is always wider than the right (for binding). Four out of ve people will now judge the margins by eye and think, “I never noticed that before.”.

The headers for the pages contain the page number on the right side (so it is easy to flick through to the page you want) and the chapter name on the left side.

The text is set to 11 point and a line spacing of 1.3. Generally, it is much more readable to have a smaller text size and wider gap between the lines than it is to have a larger text size and smaller gap. Again, you can tune the text size and spacing should you want or need to. The text size can be set in the options for the ‘**\documentclass**’ command at the top of the ‘**Thesis.tex**’ file and the spacing can be changed by setting a different value in the ‘**\setstretch**’ commands (scattered throughout the ‘**Thesis.tex**’ file).

### 1.7.2 References

The ‘`natbib`’ package is used to format the bibliography and inserts references [8, 9] such as this one.[1] The options used in the ‘`Thesis.tex`’ file mean that the references are listed in numerical order as they appear in the text. Multiple references are rearranged in numerical order [2, 5] and multiple, sequential references become reformatted to a reference range.[3, 4, 6] This is done automatically for you [7]. To see how you use references, have a look at the ‘`Chapter1.tex`’ source file.

References should come *after* the punctuation mark if there is one (such as a comma or full stop). On the other hand, footnotes<sup>1</sup> come *before* the punctuation mark. You can swap these around but the most important thing is to keep the convention consistent throughout the thesis. Footnotes themselves should be full, descriptive sentences (beginning with a capital letter and ending with a full stop).

To see how  $\text{\LaTeX}$  typesets the bibliography, have a look at the very end of this document (or just click on the reference number links).

## 1.8 Figure

Let’s discuss how user can include into his/her THESIS.



FIGURE 1.1: Figure Caption Here - Electron

### 1.8.1 Referring a Figure

One can refer to a figure in  $\text{\TeX}$ file Fig. 1.1

---

<sup>1</sup>Such as this footnote, here down at the bottom of the page.

## 1.9 Table

Many a times we got to design in our THESIS. Here it is the way

TABLE 1.1: Table Caption Here

Transformation	Equation
$\Phi \rightarrow \Phi'$	$\Phi' = \Phi + \sin^{-1}[(v/d) \cdot \sin \theta_T]$
$x \rightarrow x'$	$x' = x + d \cdot \cos \Phi + v \cdot \cos \gamma - d \cdot \cos \Phi'$
$y \rightarrow y'$	$y' = y + d \cdot \sin \Phi + v \cdot \sin \gamma - d \cdot \sin \Phi'$

### 1.9.1 Refering a Table

Refer to any table using label as Table [1.1](#)

## 1.10 Equation

...when Einstein introduced his formula

$$e = m \cdot c^2 \tag{1.1}$$

which is at the same time the most widely known and the least well understood physical formula.

...from which follows Kirchhoffs current law:

$$\sum_{k=1}^n I_k = 0 . \tag{1.2}$$

Kirchhoffs voltage law can be derived ...

### 1.10.1 Refer Equation

One can refer to any equation using label specified by the Eq [1.3](#).

... which has several advantages.

$$I_D = I_F - I_R \tag{1.3}$$

is the core of a very different transistor model. ...

## 1.11 Index Terms

To specify any word in the THESIS index as Thesis

## 1.12 In Closing

You have reached the end of this mini-guide. You can now rename or overwrite this pdf file and begin writing your own ‘`Chapter1.tex`’ and the rest of your thesis. The easy work of setting up the structure and framework has been taken care of for you. It’s now your job to fill it out! If you use this Thesis template and this mini-guide helps you, please let me know<sup>2</sup>.

Good luck and have lots of fun!

Satvir Singh Sidhu

---

<sup>2</sup>Email: [satvir15@gmail.com](mailto:satvir15@gmail.com) all comments and suggestions, questions and errata are welcome.

## Appendix A

# Appendix Title Here

Write your Appendix content here.

# References

- [1] Mendel, J. M. [2000], ‘Uncertainty, Fuzzy Logic, and Signal Processing’, *Signal Processing* **80**(6), 913 – 933.
- [2] Mendel, J. M. [2001], *Uncertain Rule-Based Fuzzy Logic Systems: Introduction and New Directions*, Prentice-Hall, Upper Saddle River, NJ.
- [3] Mendel, J. M. [2003], Fuzzy Sets for Words: A New Beginning, *in* ‘Proceedings of the 12th IEEE International Conference on Fuzzy Systems’, Vol. 1, pp. 37 – 42.
- [4] Mendel, J. M. [2005], ‘On a 50% Saving in the Computation of the Centroid of a Symmetrical Interval Type-2 Fuzzy Set’, *Information Sciences* **172**, 417 – 430.
- [5] Mendel, J. M. and John, R. I. [2002], ‘Type-2 Fuzzy Sets Made Simple’, *IEEE Transactions on Fuzzy Systems* **10**(2), 117 – 127.
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- [7] Mutneja, V., Singh, S., Gill, N. and Saini, J. S. [2008], Mobile Robot Navigation using IT2-FLS, *in* ‘Proceedings IEEE National Conference on Intelligent Systems’, Sonipat, INDIA, pp. 18 – 23.
- [8] Yager, R. R. [1980], ‘Fuzzy Subsets of Type-II in Decisions’, *Journal of Cybernetics & Systems* **10**, 137 – 159.
- [9] Zadeh, L. A. [1975], ‘The Concept of a Linguistic Variable and Its Application to Approximate Reasoning - 1’, *Information Sciences* **8**, 199 – 249.

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## *Biography*



**Satvir Singh Sidhu** was born on Dec 7, 1975. He received his Bachelors Degree (B.Tech.) from National Institute of Technology, Jalandhar with specialization in Electronics & Communication Engineering in 1998 and Masters Degree (M.E.) from Delhi College of Engineering with distinction in Electronics & Communication Engineering in 2000. His professional experience includes the teaching as Lecturer, Assistant Professor and Head, Department of Electronics Engineering at B.R.C.M. College of Engineering & Technology, Bahal (HR) India. Presently, he is working as Assistant Professor & Head, Department of Electronics Engineering at S.B.S. College of Engineering & Technology, Ferozepur (PB) India. His fields of special interest includes Type-2 Fuzzy Systems, Biological Inspired Optimization. He has registered for his Ph.D. Degree from Maharshi Dayanand University, Rohtak (HR) India, under the supervision of Dr. J. S. Saini (Chairman, Department of Electrical Engineering, D.C.R. University of Sc. & Technology, Murthal, Sonipat (HR) India) and Dr. Arun Khosla (Assistant Professor, National Institute of Technology, Jalandhar, (PB) India).

Editor and Refree of International Journal of Artificial Intelligent Systems